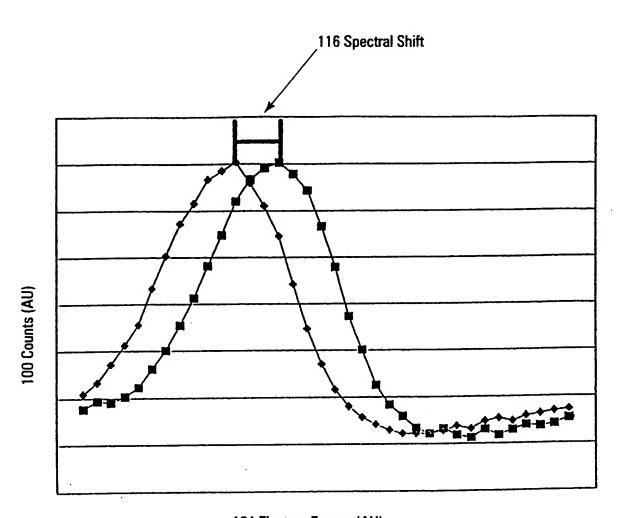
AND PROFILES DERIVED THEREFROM FOR EFFECTS OF DRIFT

Parker et al. 10/077,036

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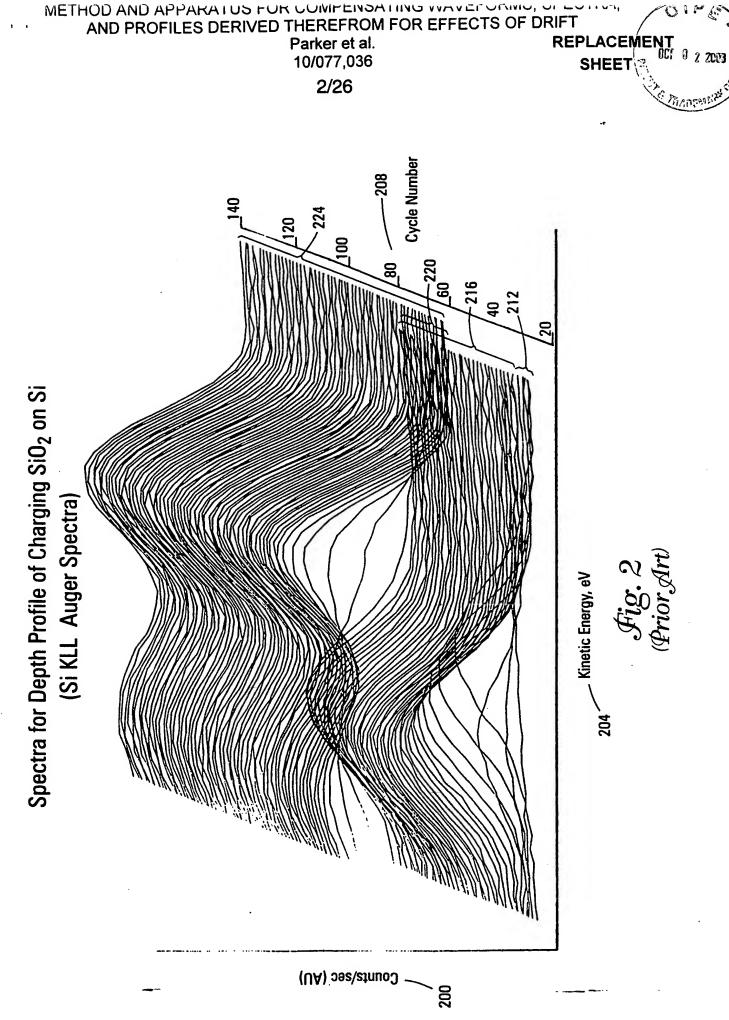
REPLACEMENT SHEET OCT 0 2 2003

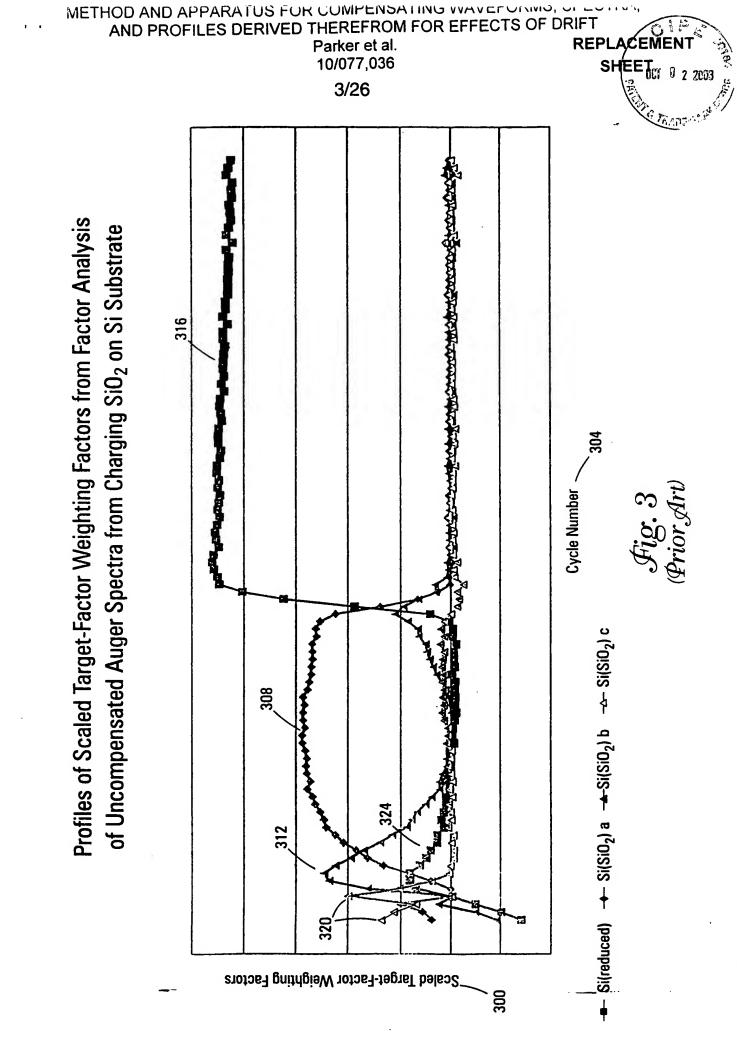


104 Electron Energy (AU)

108 Reference Spectrum
112 Shifted Spectrum

Fig. 1
(Prior Art)





METHUD AND APPARATUS FUR CUIVIFEINSATING VVAVEFURIVIO, STEUTIVA,

AND PROFILES DERIVED THEREFROM FOR EFFECTS OF DRIFT
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METHOD AND APPAKATOS FOR AND PROFILES DERIVED THEREFROM FOR EFFECTS OF DRIFT REPLACEMEN Parker et al. 10/077,036 SHEET OCT 0 2 2003 5/26 PRADE WEST SEQUENTIAL SPECTRA OBTAINED DRIFT-COMPENSATED ARRAY TO PROVIDE A SET OF DRIFT-COMPENSATED PRINCIPAL PERFORM A PRINCIPAL-FACTOR VECTORS, WHEREIN THE ARRAY OF DRIFT-COMPENSATED ROW TRANSFORM A PLURALITY OF DRIFT-COMPENSATED ARRAY TO PROVIDE AN ARRAY OF DRIFT-CUMPENSATED ROW **VECTORS CONSTITUTES A DETERMINATION ON THE** FROM A SPECTROMETER **ANALYTICAL RESULTS OUTPUT SELECTED FACTORS** RETURN 414 450 452 VECTORS, WHEREIN EACH SEQUENTIAL SPECTRUM CONSTITUTES A SUCCESSIVE ROW VECTOR OF THE PRIMAL APPLY AN EIGENANALYSIS TO THE COVARIANCE ARRAY TO DEPHASING PROCEDURE THAT TRANSFORMS THE PRIMAL INPUT A PLURALITY OF SEQUENTIAL SPECTRA FROM A FACTORS BY SELECTING A SUBSET OF EIGENVECTORS ORDER THE SPECTRA IN A PRIMAL ARRAY OF ROW REMOVE PHASE FACTORS DUE TO DRIFT USING A **DEFINE A COMPLETE SET OF EIGENVECTORS AND** DEFINE A SET OF DRIFT-COMPENSATED PRINCIPAL FROM THE COMPLETE SET OF EIGENVECTORS SPECTROMETER INTO A COMPUTER SYSTEM **ARRAY INTO A DRIFT-COMPENSATED ARRAY** FORM A COVARIANCE ARRAY FROM THE DRIFT-COMPENSATED ARRAY **EIGENVALUES** START ARRAY 408 404 412 416 420 424 450 452

AND PROFILES DERIVED THEREFROM FOR EFFECTS OF DRIFT

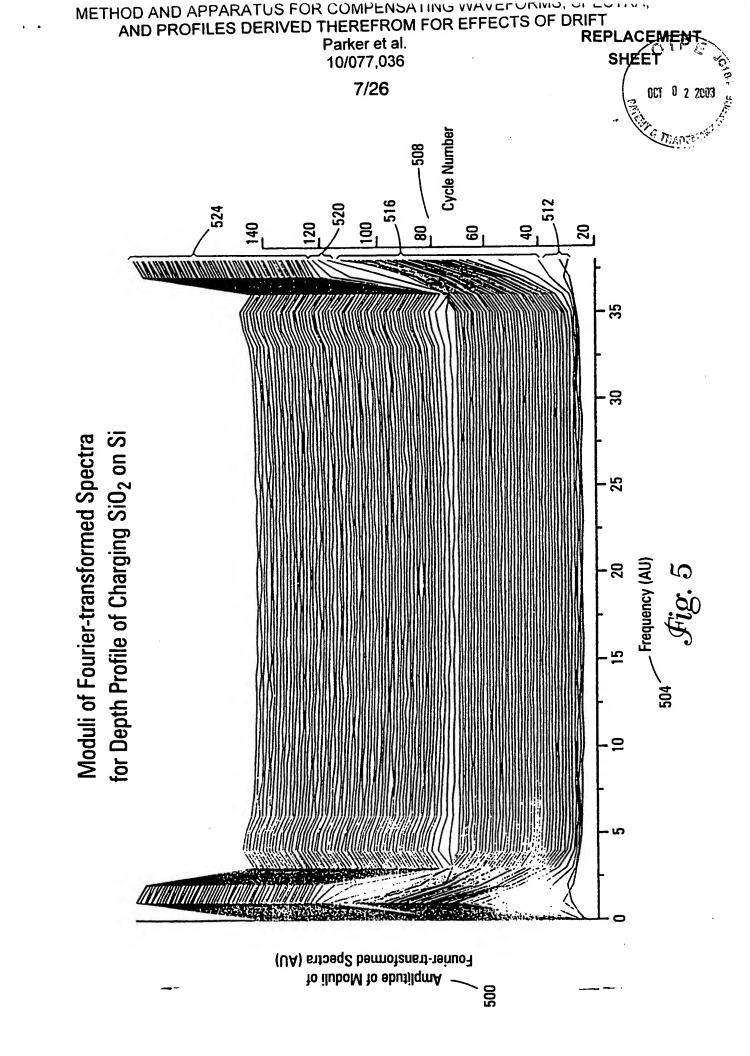
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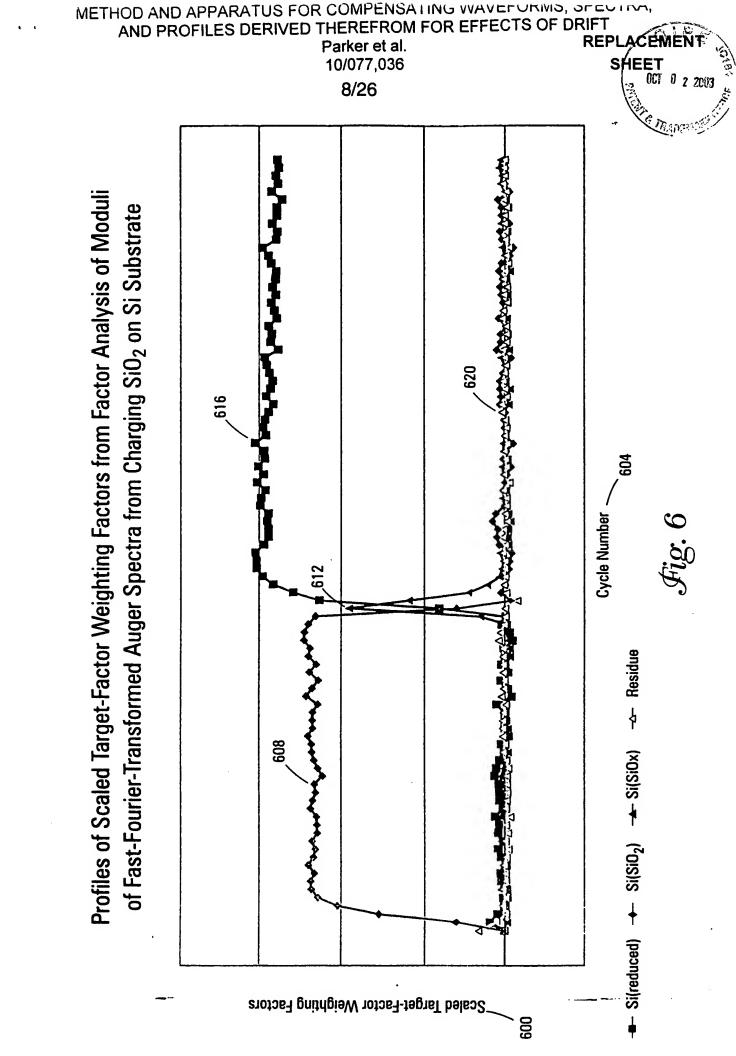
REPL Parker et al. 10/077,036 6/26 **VECTORS LYING WITHIN A SPACE** GENERATE DRIFT-COMPENSATED PROFILES FROM A PROFILE COMPOSITIONAL PROFILES DRIFT-COMPENSATED ROW OF DRIFT-COMPENSATED SCALED TARGET-FACTOR SCALED TARGET-FACTOR DRIFT-COMPENSATED TRAJECTORY OF THE DRIFT-COMPENSATED PRINCIPAL FACTORS FROM THE GENERATE **PROFILES** RETURN 454 438 **DRIFT-COMPENSATED TARGET FACTORS FOR THE PROFILE** SPACE OF DRIFT-COMPENSATED PRINCIPAL FACTORS TO SET OF TARGET-FACTOR WEIGHTING FACTORS, AND THE FACTORS TO A PROPFILE TRAJECTORY LYING WITHIN A SCALED TARGET-FACTOR PROFILES DERIVED FROM THE GROUP CONSISTING OF A SET OF DRIFT-COMPENSATED FACTORS ON A SPACE OF THE DRIFT-COMPENSATED PRINCIPAL FACTORS CONSTRUCT A SET OF DRIFT-COMPENSATED TARGET **OUTPUT ANALYTICAL RESULTS SELECTED FROM THE** APPLY THE SET OF DRIFT-COMPENSATED TARGET **OBTAIN A SEQUENTIAL SET OF TARGET-FACTOR** WEIGHTING FACTORS CORRESPONDING TO THE **SET OF DRIFT-COMPENSATED TARGET FACTORS TRAJECTORY** 

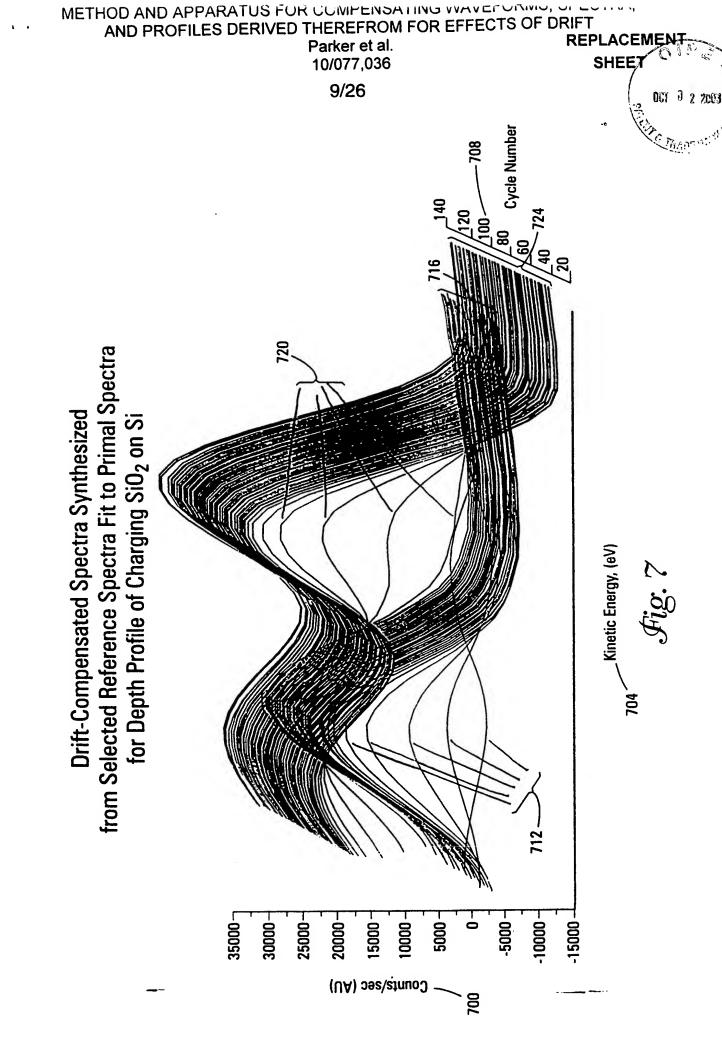
428

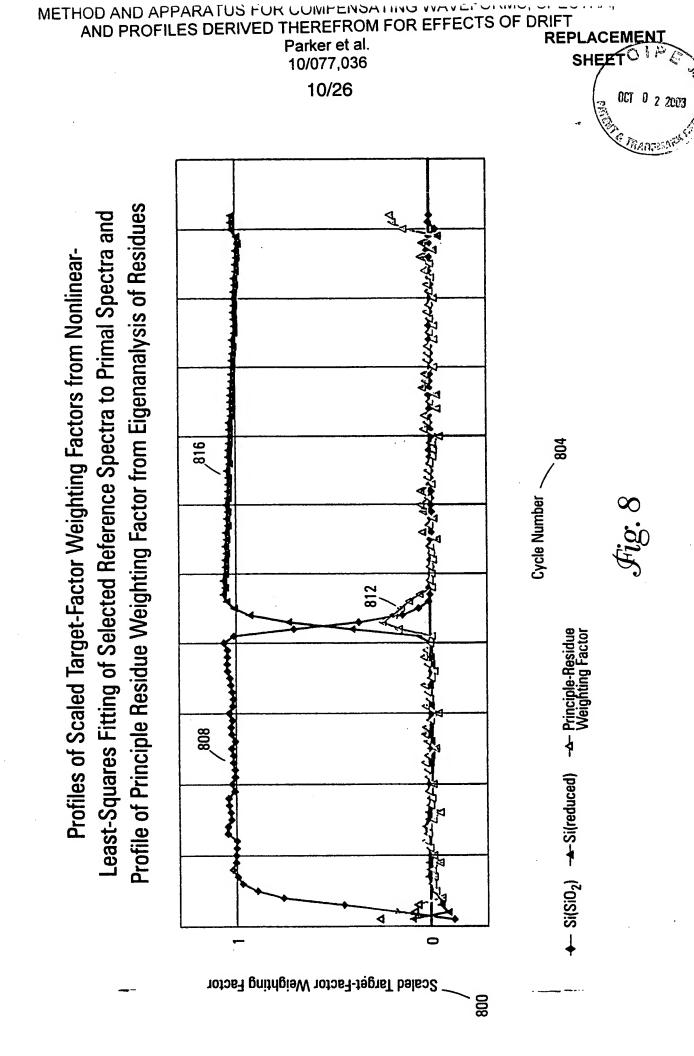
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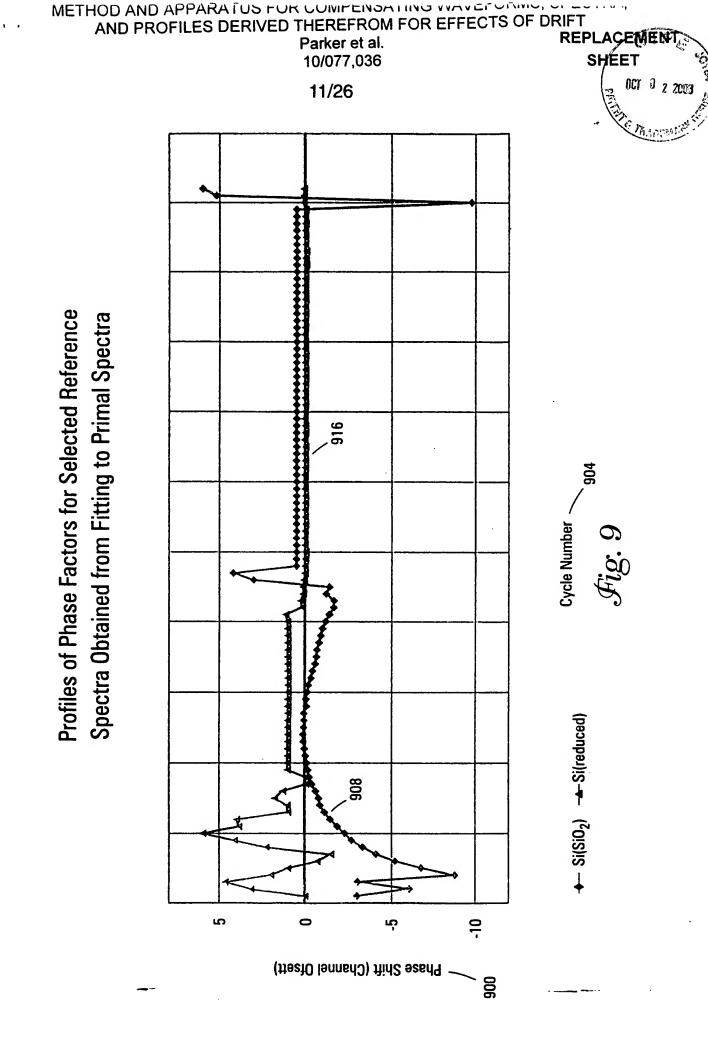
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METHOD AND APPARATUS FOR COMIT ENGATING ....-AND PROFILES DERIVED THEREFROM FOR EFFECTS OF DRIFT REPLACEMENT Parker et al. SHEET 10/077,036 OCT 0 2 2003 12/26 REMOVE PHASE FACTORS DUE TO DRIFT USING A DEPHASING PROCEDURE THAT TRANSFORMS THE PRIMAL ARRAY INTO A DRIFT-COMPENSATED ARRAY 412 1000 412 APPLY A FOURIER TRANSFORM TO THE SPECTRA IN THE PRIMAL ARRAY OF ROW VECTORS FORMING AN ARRAY OF FOURIER-TRANSFORMED ROW VECTORS 1010 MULTIPLY EACH FOURIER-TRANSFORMED ROW VECTOR BY A COMPLEX CONJUGATE OF EACH FOURIER-TRANSFORMED **ROW VECTOR TO FORM A SQUARED MODULI VECTOR** 1020THEREBY REMOVING PHASE FACTORS DUE TO DRIFT TAKE THE SQUARE ROOT OF EACH ELEMENT OF THE SQUARED MODULI VECTOR TO CREATE A CORRESPONDING **MODULI VECTOR** 1030

FORM A DRIFT-COMPENSATED ARRAY OF MODULI VECTORS BY SUCCESSIVELY SEQUENCING THE MODULI VECTORS AS SUCCESSIVE DRIFT-COMPENSATED ROW VECTORS IN A DRIFT-COMPENSATED ARRAY, WHEREIN THE MODULI VECTORS CONSTITUTE MODULI OF FOURIER-TRANSFORMED SPECTRA

METHOD AND APPARATUS FOR COMPENSATING WAVELONNIO, OF LOWER

AND PROFILES DERIVED THEREFROM FOR EFFECTS OF DRIFT

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REMOVE PHASE FACTORS DUE TO DRIFT USING A DEPHASING PROCEDURE THAT TRANSFORMS THE PRIMAL ARRAY INTO A **DRIFT-COMPENSATED ARRAY** 412

1100

412

APPLY A FITTING PROCEDURE TO EACH SPECTRUM IN THE PRIMAL ARRAY USING SELECTED REFERENCE SPECTRA 1110

CALCULATE THROUGH THE FITTING PROCEDURE A CORRESPONDING REFERENCE WEIGHTING FACTOR FOR EACH REFERENCE SPECTRUM CORRESPONDING TO EACH SPECTRUM IN THE PRIMAL ARRAY

REMOVE THE PHASE FACTOR DUE TO DRIFT FROM EACH SPECTRUM IN THE PRIMAL ARRAY BY SYNTHESIZING A CORRESPONDING DRIFT-COMPENSATED SPECTRUM GIVEN BY THE SUM OF EACH SELECTED REFERENCE SPECTRUM MULTIPLIED BY THE CORRESPONDING REFERENCE WEIGHTING FACTOR 1130

FORM A DRIFT-COMPENSATED ARRAY BY SUCCESSIVELY SEQUENCING THE DRIFT-COMPENSATED SPECTRA AS SUCCESSIVE DRIFT-COMPENSATED ROW VECTORS IN THE **DRIFT-COMPENSATED ARRAY** 1140

METHOD AND APPARATUS FOR COMPENSATING WAVE CORNS, OF LOWER AND PROFILES DERIVED THEREFROM FOR EFFECTS OF DRIFT

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PERFORM A PRINCIPAL-FACTOR
DETERMINATION ON THE
DRIFT-COMPENSATED ARRAY TO
PROVIDE A SET OF
DRIFT-COMPENSATED PRINCIPAL
452 FACTORS

SELECT A SET OF INITIAL FACTORS FROM THE SET OF DRIFT-COMPENSATED ROW VECTORS OF THE 1210 DRIFT-COMPENSATED ARRAY

PERFORM A LINEAR-LEAST-SQUARES DECOMPOSITION WITH THE SET OF INITIAL FACTORS ON THE DRIFT-COMPENSATED ROW VECTORS IN THE DRIFT-COMPENSATED ARRAY TO PROVIDE A SET OF 1220 RESIDUE FACTORS

PERFORM A GRAM-SCHMIDT ORTHONORMALIZATION ON THE COMBINED SET OF INITIAL FACTORS AND RESIDUE FACTORS

Fig. 12

TO PROVIDE DRIFT-COMPENSATED PRINCIPAL FACTORS

1230

AND PROFILES DERIVED THEREFROM FOR EFFECTS OF DRIFT

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CONSTRUCT A SET OF DRIFT-COMPENSATED TARGET FACTORS ON A SPACE OF THE DRIFT-COMPENSATED PRINCIPAL 428 FACTORS

1300

428

GENERATE A PROFILE TRAJECTORY ON A 3-DIMENSIONAL PROJECTION OF A 4-DIMENSIONAL SPACE OF A SET OF FIRST-FOUR, DRIFT-COMPENSATED PRINCIPAL FACTORS ALONG WITH A REFERENCE TETRAHEDRON THE VERTICES OF WHICH REPRESENT EACH OF THE FIRST-FOUR, 1310 DRIFT-COMPENSATED PRINCIPAL FACTORS

ENCLOSE THE PROFILE TRAJECTORY WITHIN AN ENCLOSING TETRAHEDRON WITH VERTICES CENTERED ON END-POINTS AND IN PROXIMITY TO TURNING POINTS OF THE PROFILE TRAJECTORY, AND WITH FACES LYING ESSENTIALLY TANGENT TO PORTIONS OF THE PROFILE 1320 TRAJECTORY

CALCULATE THE DRIFT-COMPENSATED TARGET FACTORS FROM THE NORMED COORDINATES OF THE VERTICES OF THE ENCLOSING TETRAHEDRON IN TERMS OF THE 1330 DRIFT-COMPENSATED PRINCIPAL FACTORS

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GENERATE A PROFILE
TRAJECTORY ON A
3-DIMENSIONAL PROJECTION OF
A 4-DIMENSIONAL SPACE OF A
FIRST-FOUR,
DRIFT-COMPENSATED PRINCIPAL
FACTORS ALONG WITH A
REFERENCE TETRAHEDRON THE
VERTICES OF WHICH REPRESENT
EACH OF THE FIRST-FOUR,
DRIFT-COMPENSATED PRINCIPAL
1310 FACTORS

1400

<u>1310</u>

1410 CALCULATE 4-SPACE COORDINATES OF A PROFILE
TRAJECTORY OF DRIFT-COMPENSATED TARGET-FACTOR
PROFILES ON A 4-DIMENSIONAL SPACE TO PRODUCE FOUR
COORDINATES FOR EACH POINT IN THE PROFILE
TRAJECTORY, ONE COORDINATE FOR EACH OF THE
FIRST-FOUR, DRIFT-COMPENSATED PRINCIPAL FACTORS

REDUCE THE DIMENSIONALITY OF THE COORDINATES OF THE PROFILE TRAJECTORY BY DIVIDING EACH COORDINATE BY A SUM OF ALL FOUR 4-SPACE COORDINATES TO PRODUCE NORMED COORDINATES FOR THE PROFILE 1420 TRAJECTORY

PLOT THE NORMED COORDINATES FOR THE PROFILE
TRAJECTORY IN A 3-DIMENSIONAL SPACE THE
COORDINATES AXES OF WHICH ARE EDGES OF A
REFERENCE TETRAHEDRON, THE VERTICES OF WHICH
CORRESPOND TO UNIT VALUES FOR EACH OF THE
FIRST-FOUR, DRIFT-COMPENSATED PRINCIPAL FACTORS IN A
MANNER ANALOGOUS TO PLOTTING OF COORDINATES ON A
1430
QUATERNARY PHASE DIAGRAM

AND PROFILES DERIVED THEREFROM FOR EFFECTS OF DRIFT

ND PROFILES DERIVED THEREPROM Parker et al. 10/077,036

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**ENCLOSE THE PROFILE** TRAJECTORY WITHIN AN ENCLOSING TETRAHEDRON WITH **VERTICES CENTERED ON END-POINTS AND IN PROXIMITY** TO TURNING POINTS OF THE PROFILE TRAJECTORY, AND WITH FACES LYING ESSENTIALLY TANGENT TO PORTIONS OF THE PROFILE TRAJECTORY; AND, CALCULATE THE **DRIFT-COMPENSATED TARGET FACTORS FROM THE NORMED COORDINATES OF THE VERTICES** OF THE ENCLOSING TETRAHEDRON IN TERMS OF THE DRIFT-COMPENSATED PRINCIPAL 1320 & 1330 FACTORS

1500

## 1320 & 1330

PLACE VERTICES OF AN ENCLOSING TETRAHEDRON AT LOCI OF HEAVY POINT CONCENTRATIONS OF A PROFILE 1510 TRAJECTORY

ADJUST THE EDGES OF AN ENCLOSING TETRAHEDRON TO LIE ALONG ESSENTIALLY STRAIGHT LINE SEGMENTS

PLACE REMAINING VERTICES OF AN ENCLOSING TETRAHEDRON SO AS TO LIE NEAR THE TURNING POINTS OF 1530 THE PROFILE TRAJECTORY

ADJUST THE FACES OF THE ENCLOSING TETRAHEDRON TO LIE ALONG CURVED SEGMENTS JOINING A TURNING POINT AND ESSENTIALLY STRAIGHT LINE SEGMENTS OF THE 1540 PROFILE TRAJECTORY

METHOD AND APPARATUS FUR CUIVIFEINSATING VVAVEFURIVIO, OFFUTIVA, AND PROFILES DERIVED THEREFROM FOR EFFECTS OF DRIFT
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Fig. 16a

Fig. 16b

METHOD AND APPARATUS FOR COMPENSATING WAVEFORMS, SCEOTIS, AND PROFILES DERIVED THEREFROM FOR EFFECTS OF DRIFT

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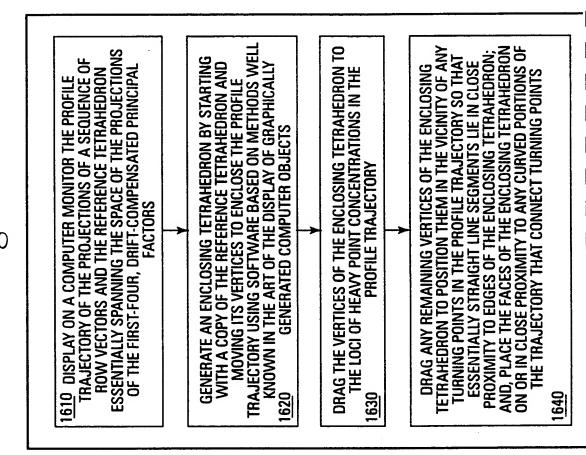


Fig. 16a

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AND PROFILES DERIVED THEREFROM FOR EFFECTS OF DRIFT

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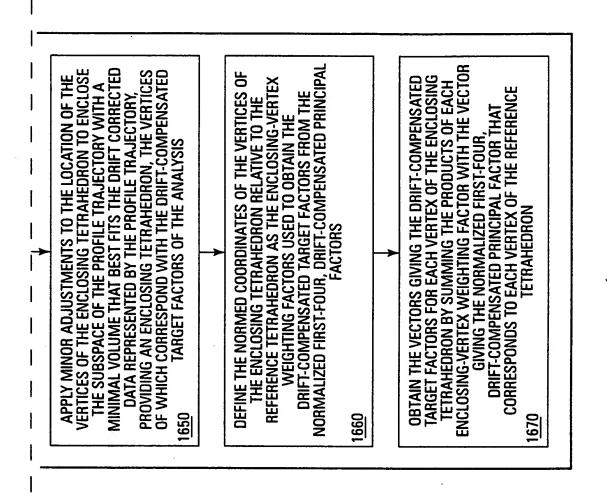


Fig. 16l

AND PROFILES DERIVED THEREFROM FOR EFFECTS OF DRIFT

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Parker et al.

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PROFILES DERIVED THEREFROM FOR EFFECTS OF DRIFT

Parker et al.

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PROFILES DERIVED THEREFROM FOR EFFECTS OF DRIFT

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Fig. 17a

AND PROFILES DERIVED THEREFROM FOR EFFECTS OF DRIFT

REPLACEMEN METHOD AND APPAKAT Parker et al. SHEET 10/077,036 OCT 0 2 2003 22/26 DRIFT-COMPENSATED SCALED SELECTED FROM THE GROUP DRIFT-COMPENSATED TARGE DERIVED FROM THE SET OF IARGET-FACTOR WEIGHTING **DUTPUT ANALYTICAL RESULT** FACTORS, AND THE SET OF TARGET-FACTOR PROFILES **CONSISTING OF A SET OF FACTORS OBTAIN THE SET OF DRIFT-COMPENSATED TARGET-FACTOR** VECTOR TO OPTIMALLY MATCH THE CORRESPONDING ROW CORRESPONDING TO THE DRIFT-COMPENSATED TARGET FACTORS BY THE TARGET-FACTOR WEIGHTING FACTORS SCALE THE AMPLITUDE OF THE RESULTING REFERENCE DRIFT-COMPENSATED TARGET FACTORS TO THE PROFIL MANNER ANALOGOUS TO FINDING COORDINATES OF **COMPOSE A REFERENCE VECTOR BY SUMMING THE** PRODUCTS FROMED BY MULTIPLYING THE VECTORS 730VECTOR COMPENSATED FOR THE EFFECTS OF DRIFT IRAJECTORY, I.E. THE TARGET-FACTOR WEIGHTING FACTORS, FROM THE ENCLOSING TETRAHEDRON IN **COORDINATES OF EACH POINT ON THE PROFILE** FOR EACH POINT ON THE PROFILE TRAJECTORY TRAJECTORY BY ASCERTAINING THE NORMED POINT ON A QUARTERNARY PHASE DIAGRAM PROFILE VALUES BY APPLYING THE SET OF ig. 17a

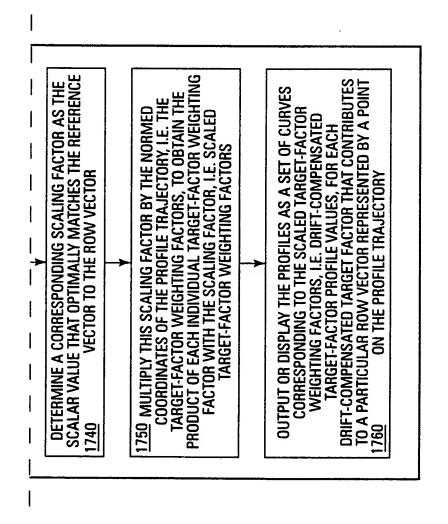
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REPLACEME



METHOD AND APPAKATUS FUR CUIVIFEINSATING WAVEFULLING,

AND PROFILES DERIVED THEREFROM FOR EFFECTS OF DRIFT

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REPLACEMENT

1800

DEFINE A SET OF DRIFT-COMPENSATED SCALED TARGET-FACTOR PROFILE VALUES AS THE SET OF SCALED TARGET-FACTOR WEIGHTING FACTORS 1810

**DIVIDE EACH DRIFT-COMPENSATED SCALED** TARGET-FACTOR PROFILE VALUE BY A PROFILE SENSITIVITY FACTOR FOR EACH CONSTITUENT CORRESPONDING TO THE TARGET FACTOR TO PROVIDE A SENSITIVITY-SCALED 1820 TARGET-FACTOR PROFILE VALUE

NORMALIZE THE SENSITIVITY-SCALED TARGET-FACTOR PROFILE VALUE BY DIVIDING EACH SENSITIVITY-SCALED TARGET-FACTOR PROFILE VALUE FOR A GIVEN CYCLE NUMBER BY THE SUM OF ALL THE SENSITIVITY-SCALED TARGET-FACTOR PROFILE VALUES FOR THE GIVEN CYCLE NUMBER TO PROVIDE DRIFT-COMPENSATED COMPOSITIONAL PROFILE VALUES AT THE GIVE CYCLE 1830 NUMBER

**OUTPUT THE DRIFT-COMPENSATED COMPOSITIONAL** PROFILE VALUES AS A SET OF DRIFT-COMPENSATED **COMPOSITIONAL PROFILES** 1840

METHOD AND APPARATUS FUR CUIVIPEINSATING VVAVETURING, STECTIVA, AND PROFILES DERIVED THEREFROM FOR EFFECTS OF DRIFT REPLACEMENT Parker et al. SHEET 10/077,036 26/26 2000 2020 **COMPUTER SYSTEM** 2030 **PROGRAM INPUT DEVICES** 2014 <u>2010</u> 2040 **COMPUTER PROCESSING ELEMENTS** 

Fig. 20

<u>2050</u>

**OUTPUT DEVICES**